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SiO_2/SnO_2 Mixed Oxide: Characterization and Aplication in electrochemical sensor

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Abstract – SiO_2/SnO_2 mixed oxide, prepared by the sol-gel processing method and chemically modified through *in situ* reaction with Mn(II) phthalocyanine (MnPc) in the pores of the solid matrix surface, is described. MnPc confined in the pores of mixed oxide was characterized by IR spectroscopy. Using voltammetrics measurements was possible to investigate the possibility tu use this material like a oxygen sensor.

Silica as porous matrix substrate for immobilization of active complex species, to fabricate electrochemical sensors and biosensors, has been subject of great interest in recent years. In particular, the mixed oxide SiO_2/SnO_2, prepared by the sol-gel processing method, is an ideal matrix for such purpose because this material may present an electric condutivity higher than others mixed oxides, due to the highly dispersed SnO_2 particles, allied to the mechanical resistance provided by the silica framework (1).

The mixed oxide was prepared by the sol-gel method according to the following procedure (2): 12 mL of tetraethylorthosilicate (TEOS), 12 mL of ethanol, 2.0 mL of deinonizated water and 0.2 mL of concentrated chloridric acid were mixed and the solution stirred 353 K for 3 h. After this TEOS prehydrolysis step, the solution was cooled to room temperature and then, 0.8 mL of Dibutyltin diacetate was added and stirred for 1h. An additional 3,0 mL of deionizated water, 0,3 mL ofconcentrated HCl (37%) were added and the resulting stirred for another 1 h. The xerogel SiO_2/SnO_2 obtained was washed with ethanol and dried under vacuum and modified with Mn(II) phthalocyanine by *in situ* reaction in the pores of the mixed oxide matrix.

The peak observed at 1532 cm^{-1}, obtained by IR, indicate the presence of manganese phthalocyanine in the material (Fig. 1).

Differential pulse voltammetry measurements of the material (SS/MnPc) in the presence of O_2, showed a linear correlation among the oxygen quantity and electrode signal (Fig. 2), showing a possibility of utilization of this material like a oxygen sensor.

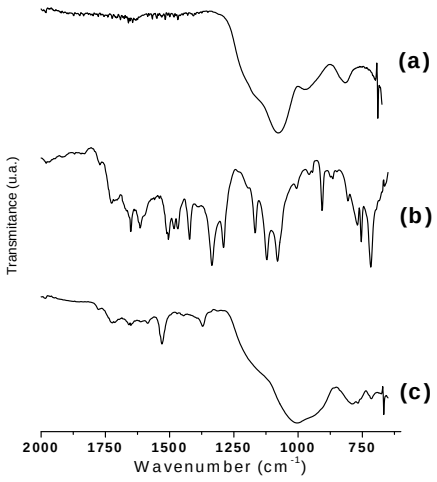

Figura 1: IR of the samples: (a) SiO_2/SnO_2, (b) MnPc and (c) SS/MnPc.

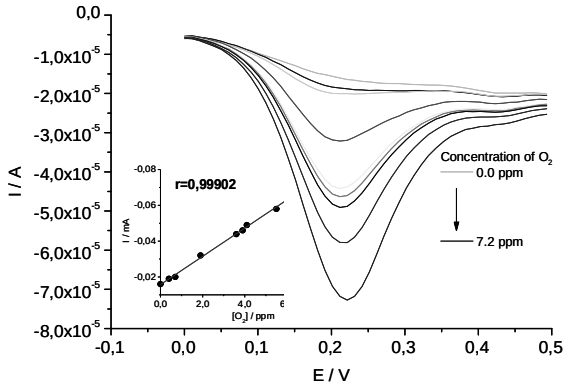

Figura 2: Differential pulse voltammograms of SS/MnPccarbon paste electrode, in KCl 1 mol l^{-1}. Inset: curve detection for differents concentration of O_2.

References

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